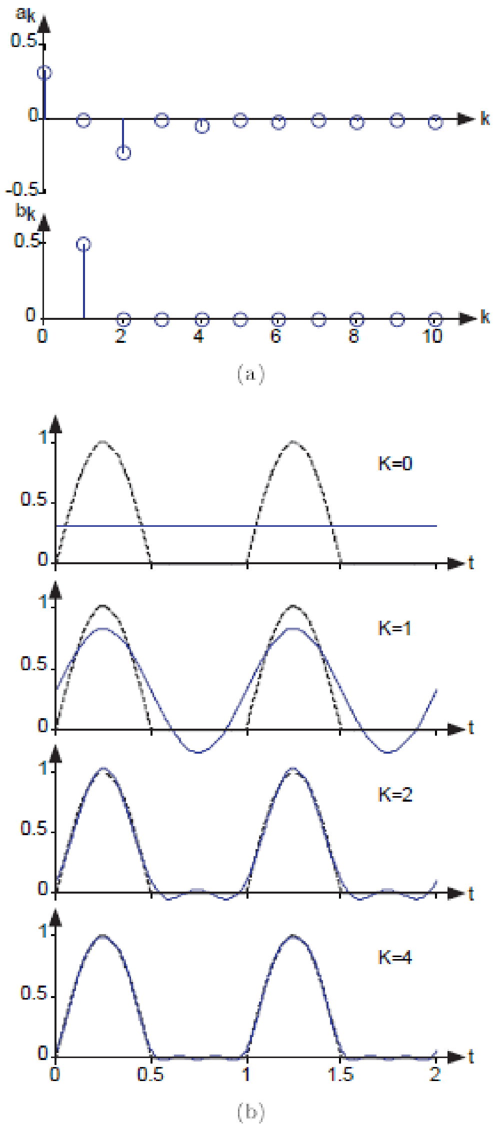

Figure 4.5 Fourier Series spectrum of a half-wave rectified sine wave The Fourier series spectrum of a half-wave rectified sinusoid is shown in the upper portion. The index indicates the multiple of the fundamental frequency at which the signal has energy. The cumulative effect of adding terms to the Fourier series for the half-wave rectified sine wave is shown in the bottom portion. The dashed line is the actual signal, with the solid line showing the finite series approximation to the indicated number of terms, K +1.

We need to assess quantitatively the accuracy of the Fourier series approximation so that we can judge how rapidly the series approaches the signal. When we use a **K +1**-term series, the error the difference between the signal and the **K +1**-term series corresponds to the unused terms from the series.

$$\in_K(t) = \sum_{k=K+1}^{\infty}\left(a_k cos\left(\frac{2\pi kt}{T}\right)\right) + \sum_{k=K+1}^{\infty}\left(b_k sin\left(\frac{2\pi kt}{T}\right)\right)$$

To find the rms error, we must square this expression and integrate it over a period. Again, the integral of most cross-terms is zero, leaving

$$rms(\in_K) = \sqrt{\frac{1}{2}\sum_{k=K+1}^{\infty}\left(a_k^{2}+b_k^{2}\right)}$$